

REMARKS

This responds to the Office Action mailed on February 24, 2005.

Claims 1, 8, 9, and 16 are amended, and claims 12-15 are canceled. No claims are added. As a result, claims 1-11 and 16-21 are now pending in this application.

Claims 1-11 and 16-21 were objected to because of an informality. For example, claim 1 recited "an electronics chip." The phrase "an electronics" has been deleted from claims 1, 8, 9, and 16, and the Applicants respectfully submit that the amendment overcomes the objection. The Applicants further respectfully submit that the amendment was made to remedy the informality, not for a reason related to patentability, and consequently does not alter the scope of the claims.

The specification has been amended at page 2, line 6, by adding a brief description for Figure 9. The added brief description is a condensation of what appears at page 9, lines 26-28 of the specification, and as such, is not new matter.

The applicant concurrently submits with this Amendment an Information Disclosure Statement.

§103 Rejection of the Claims

Claims 1-3, 5, and 16-18 were rejected under 35 USC § 103(a) as being unpatentable over Daikoku et al. (U.S. 6,351,384 B1) in view of Reisman et al. (U.S. 4,774,630). The Applicant respectfully traverses this rejection.

Daikoku relates to a device for cooling multi-chip modules (MCM). The device includes a frame 14 having a sealing top plate 20. The top plate 20 has cooling channels 21 therein.¹ The cooling channels 21 are defined by parallel fins 23.² The fins 23 have cross grooves or recesses 26 formed in their top portions.³ A cooling channel cover 30 is fixed to the top plate 20 via flange surface 17, thereby covering the cooling channels 21.⁴ An inner wall of the cooling

¹ Column 5, lines 47, 52-54.

² Column 6, line 29.

³ Column 6, lines 30-31.

⁴ Column 5, lines 54-57.

channel cover 30 has turbulent promoters or accelerators 31.⁵ When the channel cover 30 is placed over the sealing top plate 20, the turbulent promoters 31 engage the cross grooves 26.⁶ Daikoku states that it is preferable that the top plate 20 be a ceramic. Daikoku further states that it is particularly preferable that the top plate 20 be made of aluminum nitride (ALN).⁷

Reisman relates to a semiconductor device chip 3 that has its backside in contact with a substrate 1.⁸ The substrate 1 may be silicon, ceramic, or some other material.⁹ The substrate 1 may define one or more channels 10 through which a fluid or other coolant may circulate for the purpose of heat removal.¹⁰

The Office Action concedes that Daikoku fails to teach a cooling plate that is substantially made of silicon as recited in claim 1 of the present application. The Office Action addresses this shortcoming in Daikoku by stating that Resiman teaches a substrate 1, which may serve as a cooling plate, made of silicon, ceramic, or some other material. The Office Action then goes on to state that it would have been obvious to one of ordinary skill in the art at the time that the invention was made for Daikoku to employ silicon instead of Aluminum Nitride (ALN) since silicon is comparable to ALN.

The Patent Office bears the initial burden of factually supporting a *prima facie* case of obviousness.¹¹ To establish a *prima facie* case of obviousness, an Office Action must point to a suggestion or motivation to either modify a reference or combine the teachings of two or more references. The Office Action must also show that there is a reasonable expectation of success of the modification or combination. Finally, the reference or references must teach or suggest all the claim limitations.¹²

The Applicant respectfully submits that the Office Action is improperly using the prior art, hindsight, and the teachings of the Applicant's disclosure to support the rejection under 35 U.S.C. § 103. First, the Office Action points to no portion of Daikoku that suggests that the top

⁵ Column 6, lines 33-35.

⁶ Column 6, lines 38-40.

⁷ Column 6, lines 56-57, 61-63.

⁸ Column 2, lines 58-61.

⁹ Column 3, lines 9-10.

¹⁰ Column 3, lines 13-16.

¹¹ MPEP 2142.

¹² MPEP 2143.

plate 21 or the cover plate 30 may be made of anything other than a ceramic or ALN. The Office Action further points to no portion of Daikoku, or any other source for that matter, to support its contention that silicon is comparable to ALN. Also, it is not clear what the Office Action means by “comparable.” Does it mean that silicon and ALN are “similar”, “replaceable”, “substitutable?” It is simply not clear what the relationship, if any, is between silicon and ALN. The Office Action also fails to point to a portion of Reisman that indicates that the channels 10 therein may contain microchannels. There is therefore no teaching or suggestion to combine one reference with the other to support the rejection under 35 U.S.C. § 103.

Not only is there no teaching in either Daikoku or Reisman to combine one with the other, it is respectfully submitted that one of skill in the art would not be motivated to apply the silicon substrate 1 of Reisman to the cooling device of Daikoku for the reasons stated below.

Daikoku relates to an arrangement of semiconductor devices 10 that are mounted on substrate 11. A sealing top plate 20, with cooling channels 21, rests on the backside of the semiconductor devices 10. Daikoku does not disclose cooling channels within the substrate 11. Reisman on the other hand relates to a substrate 1 with which a semiconductor device 3 is in contact. Channels 10 are located within the substrate 1 through which coolant may be circulated. Reisman does not disclose a cooling unit separate from the substrate. Consequently, since the cooling systems of Daikoku and Reisman are so different, it is respectfully submitted that there is no evidence that one of skill in the art would be motivated or lead to combine one with the other. Indeed, if one of skill in the art were to combine the teachings of Reisman with Daikoku, the Applicant contends that the result would be cooling channels, without microchannels, in the substrate 11 of Daikoku, not a separate cooling unit that is substantially made of silicon as recited in claim 1 of the present application.

Therefore, since claim 1 recites a cooling plate (for example, cooling plate 101 in Figure 1) for attachment to an electronic chip (for example, chip or substrate 99 with circuitry 95), wherein the cooling plate is substantially made of silicon, claim 1 is not unpatentable over Daikoku in view of Reisman. Moreover, since claims 2-11 incorporate all the features of claim 1, they are also patentable over Daikoku in view of Reisman.

Claim 16 recites a “means for containing cooling fluid . . . inside a layer of silicon.” For at least the same reasons recited above in relation to claims 1-11, *i.e.*, that the Office Action

failed to cite evidence that it would have been obvious to combine the teachings of Reisman with Daikoku since the cooling system of Reisman is located in the substrate while the cooling system of Daikoku is located in a cooling plate that is separate from its substrate, claim 16 is patentable over Daikoku in view of Reisman. Moreover, since claims 17-21 incorporate all the features of claim 16, claims 17-21 are also patentable over Daikoku in view of Reisman.

Finally, the Applicant notes that claims 4, 6-11, and 19-21 were not rejected in the Office Action Summary or in the body of the Office Action. The Applicant therefore assumes that claims 4, 6-11, and 19-21 are allowable.

Conclusion

Applicant respectfully submits that the claims are in condition for allowance and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney ((612) 371-2140) to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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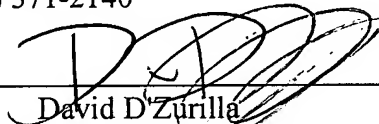
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Date June 24, 2005

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail, in an envelope addressed to: MS Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 24th day of June, 2005.

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